

FORM PTO-1390 US DEPARTMENT OF COMMERCE REV. 5-93PATENT AND TRADEMARK OFFICE		ATTORNEYS DOCKET NUMBER <b>P01,0043</b>
<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371</b>		U.S. APPLICATION NO. (if known, see 37 CFR 1.5) <b>09/787730</b>
INTERNATIONAL APPLICATION NO. <b>PCT/DE99/02889</b>	INTERNATIONAL FILING DATE <b>13 SEPTEMBER 1999</b>	PRIORITY DATE CLAIMED <b>23 SEPTEMBER 1998</b>
TITLE OF INVENTION <b>METHOD FOR IDENTIFYING A HUB CONNECTING A COMMUNICATION TERMINAL AND A SWITCHING SYSTEM</b>		
APPLICANT(S) FOR DO/EO/US <b>WOLFGANG FRAAS, ET AL.</b>		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.</li> <li>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</li> <li>5. <input checked="" type="checkbox"/> A copy of International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</li> <li>b. <input type="checkbox"/> has been transmitted by the International Bureau.</li> <li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)</li> </ol> </li> <li>6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).</li> <li>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3)) <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</li> <li>b. <input type="checkbox"/> have been transmitted by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input checked="" type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li> <li>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</li> <li>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</li> </ol>		
<b>Items 11. to 16. below concern other document(s) or information included:</b>		
11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; (PTO 1449, Prior Art, Search Report, References).		
12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included. (SEE ATTACHED ENVELOPE)		
13. <input checked="" type="checkbox"/> Amendment "A" Prior to Action. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.		
14. <input checked="" type="checkbox"/> A substitute specification and substitute specification mark-up.		
15. <input checked="" type="checkbox"/> A change of address letter attached to the Declaration.		
16. <input checked="" type="checkbox"/> Other items or information: <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> Submission of Drawings</li> <li>b. <input checked="" type="checkbox"/> EXPRESS MAIL #EL 843728606 US dated March 21, 2001</li> </ol>		

PCT/DE99/02889

JC10 Rec'd PCT/PTO 2 1 MAR 2001

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.51)

09/787730

INTERNATIONAL APPLICATION NO

PCT/DE99/02889

ATTORNEY'S DOCKET NUMBER

P01,0043

17. ☒ The following fees are submitted:

**BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5):**

Search Report has been prepared by the EPO or JPO \$860.00

International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) \$690.00

No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2)) \$710.00

Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2)) paid to USPTO \$1000.00

International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$ 100.00

**ENTER APPROPRIATE BASIC FEE AMOUNT = \$ 860.00**

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).

Claims

Number Filed

Number Extra

Rate

Total Claims

13

- 20 =

0

X \$ 18.00

Independent Claims

01

- 3 =

0

X \$ 80.00

Multiple Dependent Claims

\$270.00 +

**TOTAL OF ABOVE CALCULATIONS = \$ 860.00**

Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)

**SUBTOTAL = \$ 860.00**

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +

**TOTAL NATIONAL FEE = \$ 860.00**

Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). \$40.00 per property +

**TOTAL FEES ENCLOSED = \$ 860.00**

Amount to be refunded

charged

a. ☒ A check in the amount of \$860.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which maybe required, or credit any overpayment to Deposit Account No. 50-1519. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

STEVEN H. NOLL

NAME

28,982

Registration Number

09/787730

BOX PCT

IN THE UNITED STATES DESIGNATED/ELECTED OFFICE  
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE  
UNDER THE PATENT COOPERATION TREATY – CHAPTER II

**AMENDMENT "A" PRIOR TO ACTION AND  
SUBMISSION OF SUBSTITUTE SPECIFICATION**

APPLICANT(S): FRAAS, W., et al.  
ATTORNEY DOCKET NO: P01,0043  
INTERNATIONAL APPLICATION NO: PCT/DE99/02889  
INTERNATIONAL FILING DATE: 13 SEP 1999  
INVENTION: METHOD FOR IDENTIFYING A  
HUB CONNECTING A  
COMMUNICATION TERMINAL  
AND A SWITCHING SYSTEM

Assistant Commissioner for Patents  
Washington, DC 20231

Sir:

Applicants herewith submit an amendment and substitute  
specification in the above-referenced PCT application, and request entry of  
same prior to examination in the United States National Stage.

**IN THE SPECIFICATION**

Cancel the specification as filed, and insert therefore the substitute  
specification provided herewith.

**IN THE CLAIMS**

Cancel claims 1 –13 as filed, and insert therefore new claims 14 - 26

09/787730-0394

as follows:

- - What is claimed is:

14. A method for identifying a hub connected between a communication terminal and a switching system, wherein a plurality of hubs are connected to the switching system via a communication network, the method comprising the steps of:

forming a time-slot-oriented data format from a periodic sequence of channel-oriented information segments;

connecting the communication terminals to the hubs;

setting up a data transmission between the switching system;

associating the hubs with an unambiguous address in the communication network; and

transmitting the address of a hub via the communication network to the switching system in an agreed information segment upon request.

15. The method of claim 14, wherein the request is made during a message transmission from the switching system to the communication terminal.

16. The method of claim 14, wherein the request is made during a message transmission from the communication terminal to the switching system.

17. The method of claim 16, wherein the address is transmitted in a monitor channel transmitting configuration information of the time-slot-oriented data format.

18. The method of claim 17, further comprising the step of:

indicating the request by transmitting an agreed bit combination in a signaling channel of the time-slot-oriented data format.

19. The method of claim 17, further comprising the step of:

indicating the request by a simplified protocol being transmitted in at least one of, the signaling channel or a monitor channel, which transmits configuration information concerning the time-slot-oriented data format.

20. The method of claim 19, wherein the time-slot-oriented data format is the standardized IOM-2 data format.

21. The method of claim 20, further comprising the step of:

indicating the request by bits transmitted via monitor status channels of the IOM-2 data format to the hub being identical.

22. The method of claim 21, wherein the address length is one of, 1 byte, or an integral multiple thereof.

23. The method of claim 22, wherein a data transmission via the communication network takes place on the basis of the ATM data format.

24. The method of claim 23, wherein a bi-directional conversion is made between the time-slot-oriented data format and the ATM data format for transmitting data via the communication network by the switching system and the hub.

25. The method of claim 24, wherein the bi-directional conversion between the time-slot-oriented data format and the ATM data format takes place in accordance with a first ATM adaptation layer AAL-Typ1.

26. The method of claim 25, wherein the bi-directional conversion between the time-slot-oriented data format and the ATM data format takes place in accordance with a second ATM adaptation layer AAL-Typ2. - -

**IN THE ABSTRACT**

Cancel the Abstract as filed and insert therefore on a separate page, the following Abstract of the Disclosure:

**- - ABSTRACT OF THE DISCLOSURE**

Communication terminals are connected to a communication network via at least one hub having an unambiguous address in the communication network. Data transmission between the switching system and the communication terminals is provided using a time-slot-oriented data format formed from a periodic sequence of channel-oriented information segments. The address of the hub is transmitted from the hub to the switching system in an agreed information segment. - -

**REMARKS**

A substitute specification and a proper abstract of the disclosure are provided herewith which make editorial changes in order to conform to standard US practice. A marked-up copy of the specification is also provided reflecting the changes made.

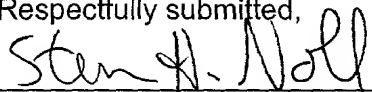
In addition, the claims as filed have been canceled and replaced by new claims that more clearly set forth Applicants' invention.

No new matter has been inserted into the application.

09787390-03404  
"03404" DE 23460

Applicants submit that this application is in proper condition for examination in the United States National Stage, which action is earnestly solicited.

Respectfully submitted,



Steven H. Noll (Reg. No. 28,982)

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BOX PCT

IN THE UNITED STATES DESIGNATED/ELECTED OFFICE  
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE  
UNDER THE PATENT COOPERATION TREATY – CHAPTER II

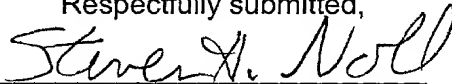
**SUBMISSION OF DRAWINGS**

APPLICANT(S): FRAAS, W., et al.  
ATTORNEY DOCKET NO: P01,0043  
INTERNATIONAL APPLICATION NO: PCT/DE99/02889  
INTERNATIONAL FILING DATE: 13 SEP 1999  
INVENTION: METHOD FOR IDENTIFYING A HUB  
CONNECTING A COMMUNICATION  
TERMINAL AND A SWITCHING  
SYSTEM

Assistant Commissioner for Patents  
Washington, DC 20231

Sir:

Applicants herewith submit four drawing sheets, showing Figures 1 – 4 in  
the captioned PCT application.

Respectfully submitted,  
  
Steven H. Noll (Reg. No. 28,982)

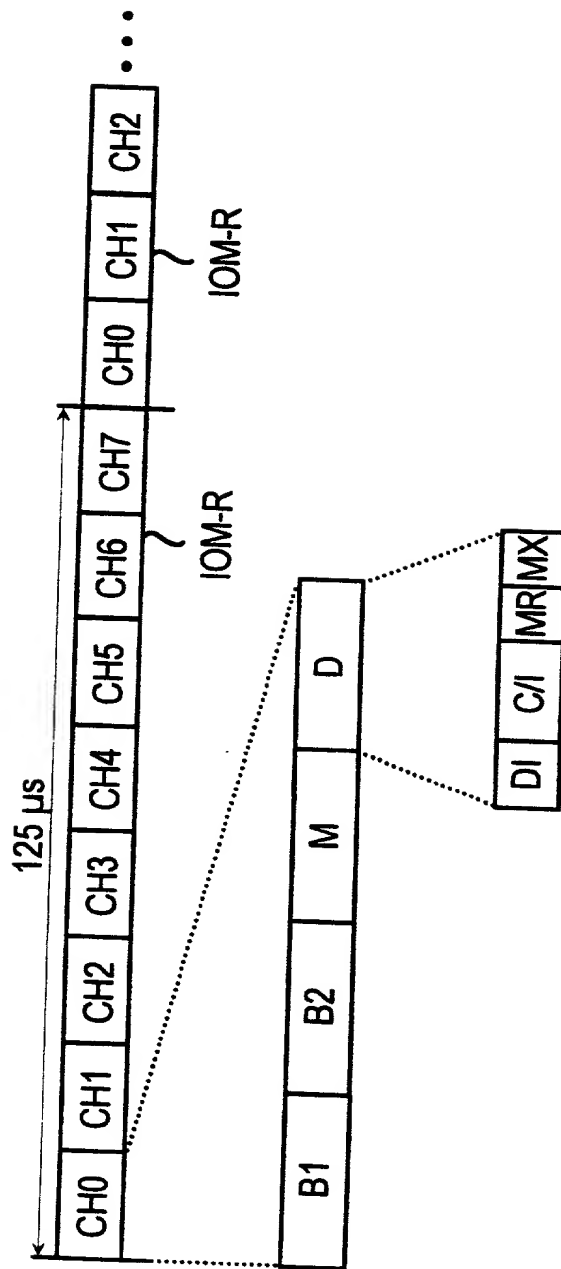
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09/787730-03401



Fig 1



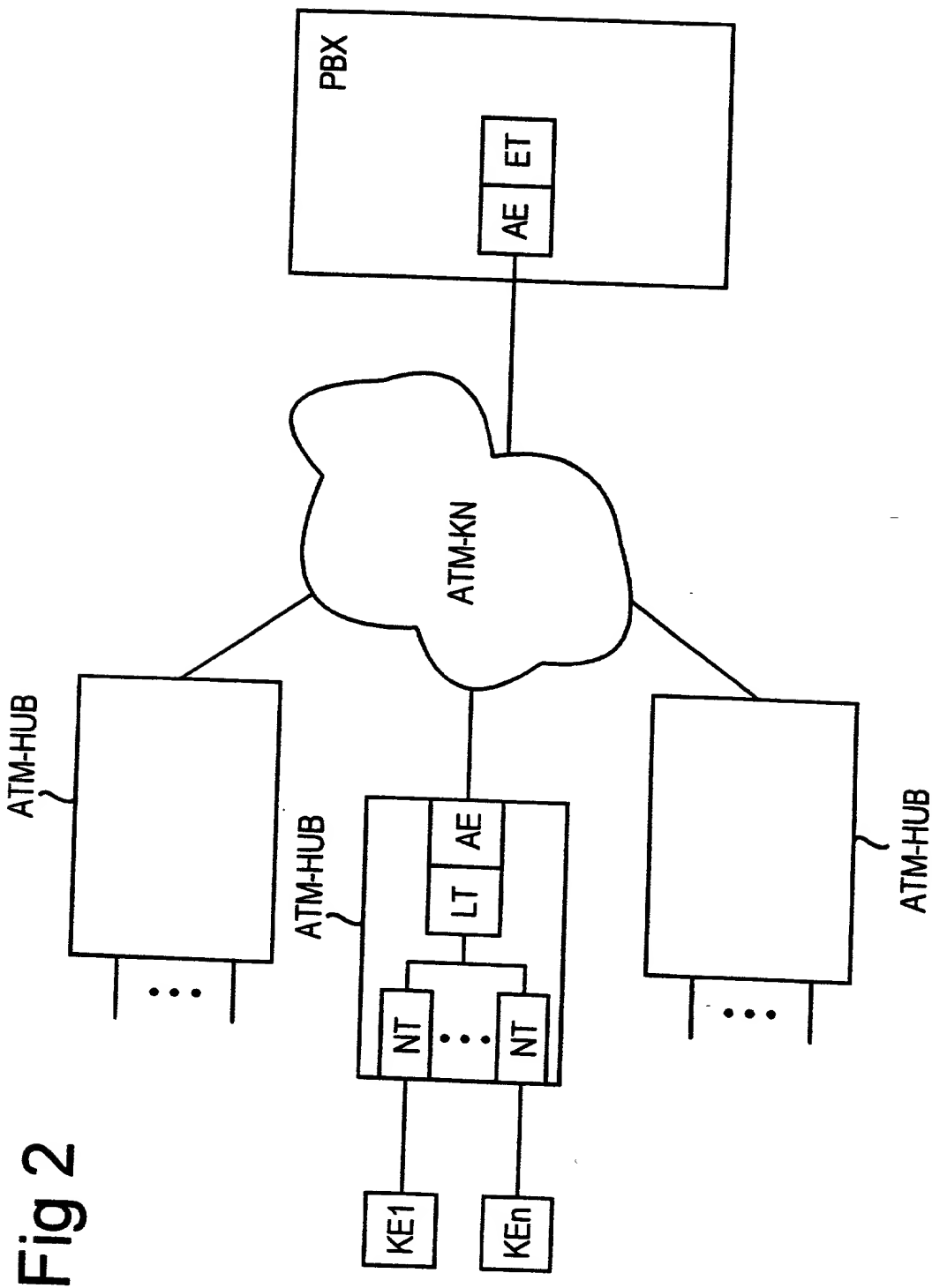
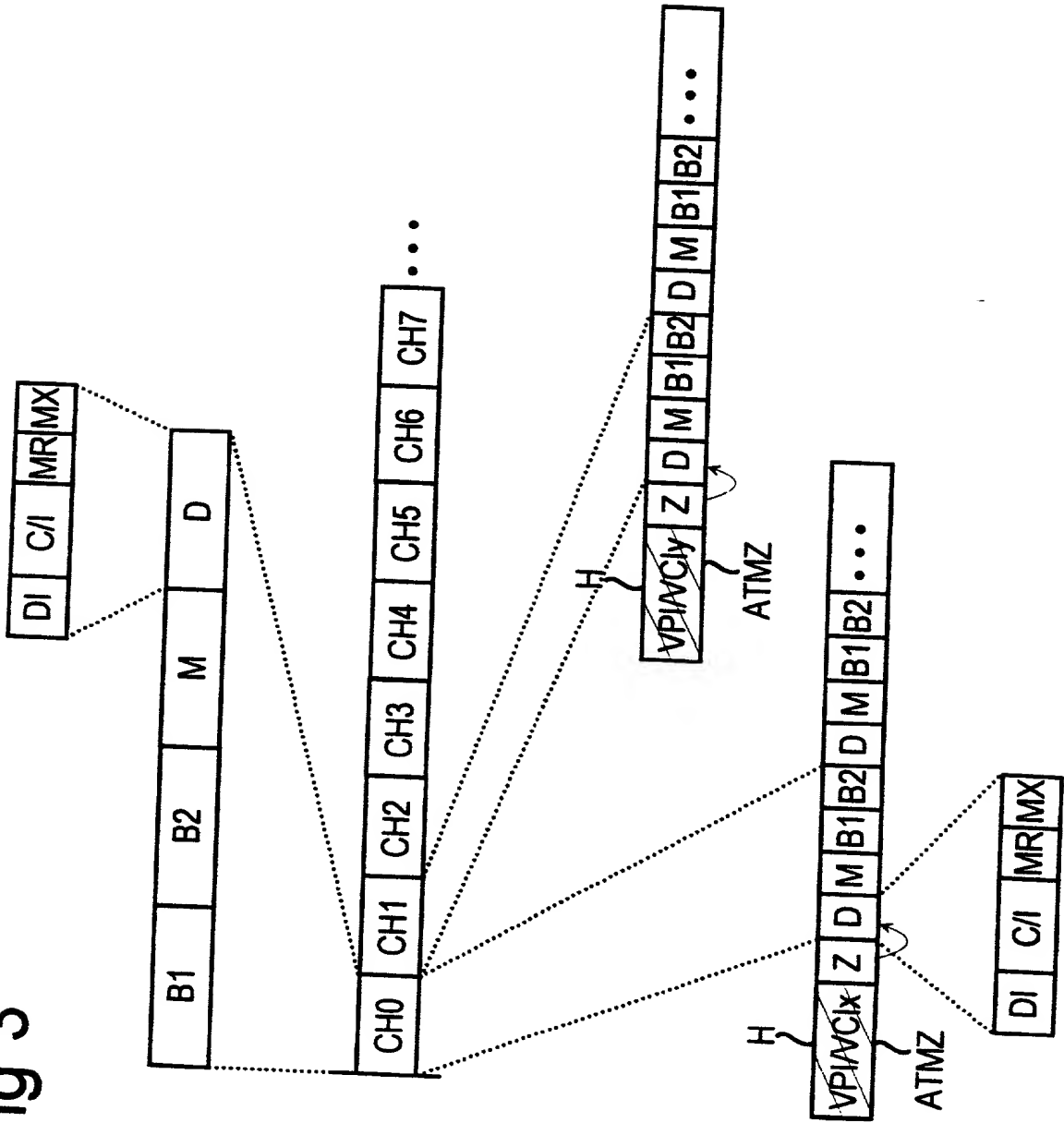
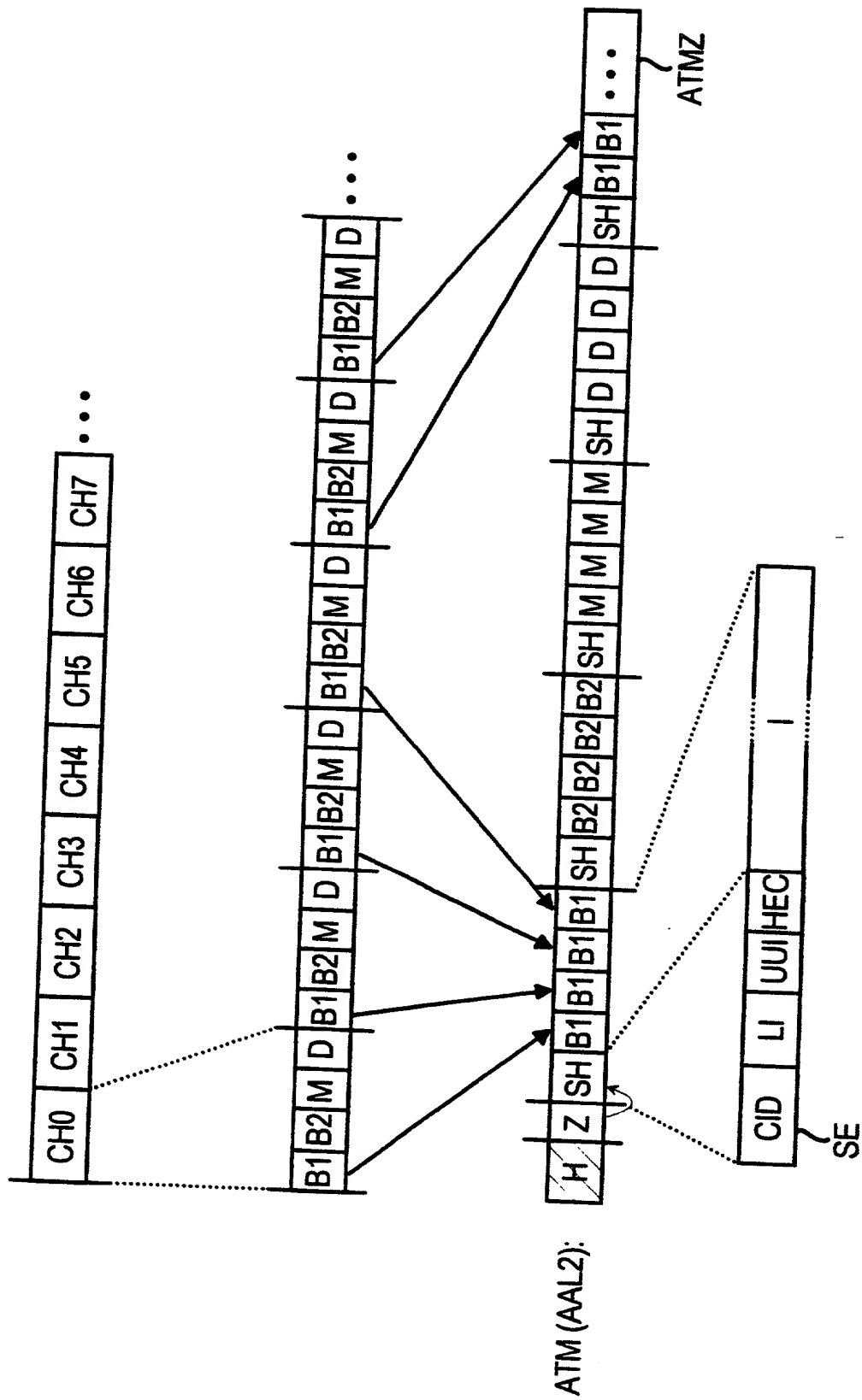


Fig 2

Fig 3



**Fig 4**



Substitute Specification:

**-- METHOD FOR IDENTIFYING A HUB CONNECTING A  
COMMUNICATION TERMINAL AND A SWITCHING SYSTEM**

**BACKGROUND OF THE INVENTION**

**Field of the Invention:**

The present invention pertains to data transmission systems generally, and in particular to transmission systems for time-slot-oriented data.

**Discussion of the Related Art:**

A transmission system for transmitting time-slot-oriented data between an exchange termination and a line termination is usually part of a communication system having a switching facility and subscriber line facilities. The subscriber line facilities have subscriber interfaces for connecting communication terminals to the communication system.

According to the ITU-T G.960 Standard, the subscriber line facilities are connected to the switching facility of the communication system via a line termination and an exchange termination. Such a communication system is used for setting up and, respectively, clearing down narrow-band communication connections between communication terminals connected to the subscriber line facilities and to provide for narrow-band

communication - for example voice or data communication - between the communication terminals.

In modern communication systems, data transmission between the exchange termination and the line termination usually takes place on the basis of the time-slot-oriented data format IOM-2 (ISDN Oriented Modular Interface) formed from a periodic sequence of channel-individual information segments - called time-division multiplex channel in the text which follows. As a rule, one time-division multiplex channel is in each case allocated to each subscriber interface of a subscriber line facility in this arrangement.

In modern communication engineering, there is a need for broadband transmission of information such as, for example, still and moving pictures in videophone applications or of large volumes of data in the Internet. This increases the significance of transmission techniques for high and variable data transmission rates (greater than 100 Mbit/s) which take into account both the requirements of the data transmission (high speed at variable transmission bit rate) and the requirements of voice data transmission (maintaining time correlations with a data transmission via a network) so that the separate networks currently existing for the various purposes can be integrated in one network. A known data transmission method for high data speeds is the so-called Asynchronous Transfer Mode (ATM). Data transmission on the basis of the Asynchronous Transfer Mode

currently enables a variable transmission bit rate of up to 622 Mbit/s to be obtained.

In the cell-based data transmission method known as Asynchronous Transfer Mode (ATM), so-called ATM cells are used for transporting fixed-length data packets. An ATM cell is composed of a so-called "header" with a length of five bytes which contains switching data relevant to the transportation of an ATM cell, and a so-called "payload" with a length of 48 bytes.

Data transmission via an ATM-based network generally takes place in so-called virtual paths or virtual channels. For this purpose, interconnection tables with switching information consisting of a virtual channel identifier and of a virtual path identifier are set up in the respective ATM network nodes of the ATM-based network by an exchange of signaling information during a connection set-up before the beginning of the actual user data transmission. In the interconnection tables, a so-called VCI value is assigned to the virtual channel identifier and a so-called VPI value is assigned to the virtual path identifier.

The switching information entered in the interconnection table of an ATM network node establishes how the virtual paths or, respectively, virtual channels contained in the virtual paths of the incoming and outgoing connections at the ATM network node are correlated with one another by the signaling, that is to say which input is connected to which output by a

switching. ATM cells transmitted via these virtual connections (virtual paths and virtual channels) have switching data essentially consisting of a VPI value and a VCI value in the header. The ATM header data are processed, i.e. the switching data arranged therein are detected and evaluated at the input of an ATM network node. The ATM cells are then switched through by the ATM network node to an output of the ATM network node representing a certain destination by means of the switching information stored in the interconnection table.

German Offenlegungsschrift DE 196 04 244 A1, shows a transmission system between an exchange termination and a line termination in which transmission is implemented via an ATM-based network. In this arrangement, subscriber interfaces for connecting ISDN (Integrated Services Digital Network) oriented communication terminals by ATM hubs connected to the ATM-based network are provided. The exchange termination of the communication system and the line termination implemented by the ATM hub have an ATM interface unit via which, on the one hand, a connection to the ATM-based network is implemented and, on the other hand, the IOM-2 data format usually provided for a data transmission between the exchange termination and the line termination is converted to the ATM-based data format. Or, the ATM-based data format is converted to the IOM-2 data format.

For addressing a subscriber interface of the ATM hub via the ATM-



based network, a permanently set up ATM channel of the ATM-based network is allocated to each time-division multiplex channel of the IOM-2 data format, i.e. an unambiguous VPI/VCI address is allocated to each subscriber interface of an ATM hub for a data transmission via the ATM-based network. The VPI-VCI addresses are allocated to the respective subscriber interfaces and managed manually in the switching system.

If a fault occurs at a subscriber interface or at a communication terminal connected to the subscriber interface, only the VPI/VCI address of the defective subscriber interface or of the communication terminal connected to the subscriber interface is known in the switching system. It is not possible to find the ATM hub associated with the communication terminal.

A method for finding the association of a communication terminal with a subscriber interface of an ATM hub which is already used is the tracing back of the path in the ATM-based network starting from the switching system to the communication terminal, i.e. determining the path in the ATM-based network by means of the switching information stored in the ATM network nodes. In most cases, however, this is not possible since the operator of the ATM-based network is not, as a rule, the operator of the telecommunication network implemented on this. The switching information stored in the ATM network nodes is thus not available to the operator of the telecommunication network.

Thus, according to the terminology of the ITU-T G.960 Standard (3/93) "access digital section for ISDN basic rate access", especially pages 2 and 3, the present invention is based on data transmission occurring at the V reference point.

### **SUMMARY OF THE INVENTION**

It is an object of the present invention to provide a method for determining the ATM hub associated with a communication terminal in a simple manner.

It is another object of the invention to provide a method that can easily be implemented without making changes at the interface between switching system and ATM hub.

It is an additional object of the invention to provide a method wherein the susceptibility to faults is reduced by an automatic detection of the association between a communication terminal and an ATM hub.

It is a further object of the invention to provide a method wherein existing free transmission capacities are utilized by way of a monitor channel for transmitting the address of an ATM hub to a switching system.

These and other objects of the invention will become apparent from a review of the following detailed description of the preferred embodiment,

which is to be read in conjunction with a review of the accompanying drawing figures.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

- Figure 1 shows a diagrammatic representation of an IOM-2 data format;
- Figure 2 shows a diagrammatic representation of essential functional units according to the present invention;
- Figure 3 shows a diagrammatic representation of a conversion of a time-slot-oriented data format into an ATM data format according to the present invention; and
- Figure 4 shows a diagrammatic representation of a conversion of another time-slot-oriented data format into an ATM data format according to the present invention.

### **DETAILED DESCRIPTION OF THE REFERRED EMBODIMENTS**

To obtain a better understanding of the operation of a transmission of time-slot-oriented data between an exchange termination and a line termination, here is a discussion of basic principles.

Time-slot-oriented data are usually transmitted between an

exchange termination and a line termination on the basis of a known data format. An example of which is IOM-2 described in the product document "ICs for Communications - IOM<sup>®</sup>-2 Interface Reference Guide" by Siemens, Munich, 3/91, order No. B115-H6397-X-X-7600, particularly pages 6 to 12.

Figure 1 shows a diagrammatic representation of the IOM-2 data format wherein time division multiplex frames IOM-R having a length of 125  $\mu$ s are periodically transmitted. Such a time-division multiplex frame IOM-R is divided into time-division multiplex channels or subframes CH0 - CH7, which are frequently simply called 'channels' in the literature.

The subframes CH0 - CH7, in turn, are subdivided into two 8-bit-long payload channels B1, B2, into an 8-bit-long monitor channel M, into a 2-bit-long control information channel DI, into a 4-bit-long status channels C/I (Command/Indicate), and into two monitor status channels MR, MX which in each case have a length of 1 bit. The control information channel DI, the status channel C/I and the two monitor status channels MR, MX are usually combined and referred to as a control information channel D. Channel D is sometimes referred to as signaling channel D.

Via the user data channels B1, B2, user data are transmitted between facilities connected to an IOM-2 bus with a transmission bit rate of 64 kbit/s in each case. Via the control information channel D, control information associated with the user data are transmitted at a transmission

bit rate of 16 kbit/s. The monitor channel is used, among other things, for configuring facilities connected to an IOM-2 bus on the basis of a so-called 'IOM-2 bus master'. Via the monitor status channels MR (Monitor Read) and MX (Monitor Transmit) it is established whether data from a facility connected to the IOM-2 bus are read from the IOM-2 bus (MR = 1, MX = 0) or are output to the IOM-2 bus (MR = 0, MX = 1). Via the status channel C/I, information on real-time requirements existing for a data transmission between two facilities connected to the IOM-2 bus are exchanged.

Figure 2 shows a diagrammatic representation of a PBX (Private Branch Exchange) switching system with an exchange termination (ET) arranged therein. The exchange termination ET is connected to an ATM-based communication network ATM-KN via an interface unit AE.

Furthermore, ATM hubs ATM-HUB, which have subscriber interfaces for connecting communication terminals to the ATM-based communication network ATM-KN, are connected to the ATM-based communication network ATM-KN. Communication terminals KE1 - KEn are shown by way of example.

ISDN (Integrated Services Digital Network) communication terminals are usually connected to the ATM-based communication network ATM-KN by means of  $S_0$  interfaces. Or, digital communication terminals are usually connected to the ATM-based communication network ATM-KN by means of interfaces derived therefrom, such as for example,  $U_{p0}$  interfaces, via an

ATM hub. In general, a  $U_{p0}$  or an  $S_0$  interface comprises, on the one hand, two user data channels which are equipped with a transmission rate of 64 kbit/s in each case as ISDN-oriented B channels, and on the other hand, a signaling channel configured as an ISDN-oriented D channel with a transmission rate of 16 kbit/s. Furthermore, it is generally possible to connect analog communication terminals to the ATM-based communication network ATM-KN via a/b interfaces.

Communication terminals KE1 - KEn are connected to the ATM hub ATM-HUB. Thus, the subscriber interfaces are provided by the ATM hub ATM-HUB by network terminations NT according to the terminology of the ITU-T G.960 Standard. Based upon the ITU-T G.960 Standard, the network terminations of an ATM hub ATM-HUB are connected to the exchange termination ET of the switching system PBX via a line termination LT arranged in the ATM hub ATM-HUB. For a data transmission via the ATM-based communication network ATM-KN, the line termination LT, corresponding to the exchange termination ET of the switching system PBX, is connected to the ATM-based communication network ATM-KN via an interface unit AE.

Interface units AE provide a bi-directional conversion between the time-slot-oriented IOM-2 data format usually provided for a data transmission between the exchange termination and the line termination, and the packet-oriented ATM data format according to two different conversion modes, which will be explained in greater detail below.

Figure 3 shows a diagrammatic representation of the conversion of the IOM-2 data format into the ATM data format according to the first conversion mode. In this mode, time-slot-oriented data are packed byte by byte into ATM cells according to the first ATM adaptation layer AAL1 on the basis of the CES 2.0 rule of the ATM Forum. The ATM adaptation layer AAL is used for adopting the ATM cell format to the network layer (Layer 3) of the OSI (Open System Interconnection) Reference Model.

In a conversion of the time-slot-oriented data format to the packet-oriented ATM data format, each subframe CH<sub>x</sub> is allocated an unambiguous VPI/VCI address for transmission via the ATM-based communication network ATM-KN. Thus, data allocated to different subframes CH<sub>x</sub>, are transmitted in separate ATM cells ATMZ having an unambiguous VPI/VCI address stored in the header H of the ATM cell ATMZ, which is shown by way of example with the VPI/VCI address VPI/VCI<sub>x</sub> for subframe CH<sub>0</sub> and with VPI/VCI address VPI/VCI<sub>y</sub> for subframe CH<sub>1</sub>.

In addition to the header H of the ATM cell ATMZ, the first byte in the payload area is defined as pointer Z. This pointer Z points to the first byte of the data allocated to a subframe CH<sub>x</sub> within the payload area of an ATM cell ATMZ. This pointer Z provides the possibility of restoring synchronization between transmitter and receiver in the case where one or more ATM cells ATMZ have been lost, such as due to a transmission fault.

The first ATM adaptation layer AAL1, in a byte-by-byte manner, converts all 4 channels following one another in time in a subframe CHx, to the ATM cell format according to the ECMA Standard 277 (Standardizing Information and Communication Systems), including the two payload channels B1, B2, the monitor channel M and the control channel D.

Payload information is transmitted beginning with the second byte of the payload area of an ATM cell ATMZ. The data allocated to the individual channels of a subframe CHx, shown by way of example for subframes CH0, CH1 in the figure, are transmitted in succession beginning with the data of the control channel D, followed by the data of the monitor channel M, the data of the first payload channel B1 and the data of the second payload channel B2.

Following insertion of the data of the second payload channel B2 into the payload area of an ATM cell ATMZ, the data of the control channel D of the corresponding following subframe CHx, shown by way of example for subframes CH0, CH1 in the figure, are read in.

Bytes arranged in the payload area of an ATM cell ATMZ are thus allocated to a channel, to the first payload channel B1, to the second payload channel B2, to the monitor channel M and to the control channel D, of a subframe CHx via the position of the byte in the payload area of the ATM cell ATMZ.



Figure 4 shows the conversion of the IOM-2 data format into the ATM data format according to the second conversion mode in a diagrammatic representation. In this mode time-slot-oriented data are packed byte by byte into ATM cells ATMZ according to the second ATM adaptation layer AAL2. In the second ATM adaptation layer AAL2, it is possible to subdivide the payload area of an ATM cell ATMZ into so-called substructure elements SE.

A substructure element SE according to the second ATM adaptation layer AAL2 is composed of a 3-byte-long header SH and a payload area I of variable length (0 to 64 bytes). The header SH of a substructure element SE according to the second ATM adaptation layer AAL2 is in turn subdivided into an 8-bit-long channel identifier CID, a 6-bit-long length indicator LI, a 5-bit-long user-to-user indication UUI, and a 5-bit-long header error control HEC.

Subdividing an ATM cell ATMZ into substructural elements SE makes it possible to define a number of channels by means of the channel identifier CID in an ATM connection, all of which channels are addressed with the same ATM address consisting of a VPI value and a VCI value.

During a data transmission between the switching system PBX and an ATM hub ATM-HUB, particularly in exchange termination ET and line

termination LT, it is thus possible to define substructural elements SE for the transmission of channel-oriented data of a subframe CHx.

In addition to the header H of the ATM cell ATMZ, the first byte in the payload area is defined as pointer Z. This pointer Z points to the first byte of a substructural element SE arranged in the payload area of an ATM cell ATMZ. This pointer Z can be used for restoring synchronization between transmitter and receiver in the case where one or more ATM cells ATMZ have been lost, such as due to a transmission fault.

In the present embodiment, an individual substructural element SE is defined for the first payload channel B1, the second payload channel B2, the monitor channel M, and the control channel D, and is then transmitted in the payload area of the ATM cell ATMZ. By way of example, a payload area I of the substructural element SE with a length of 4 bytes is shown in Figure 4. Following the substructural element SE allocated to the control channel D, the substructural element SE allocated to the first payload channel B1 of the corresponding subframe CHx is transmitted in the payload area of an ATM cell ATMZ.

In the case of an ATM cell ATMZ according to the second ATM adaptation layer AAL2, in contrast to an ATM cell ATMZ according to the first ATM adaptation layer AAL1, a payload byte is allocated to a channel, to the first payload channel B1, to the second payload channel B2, to the monitor channel M and to the control channel D, of a subframe CHx not via

the position of the payload byte in the payload area of the ATM cell ATMZ but via the channel identifier CID.

For addressing a communication terminal KE1 - KEn connected to an ATM hub ATM-HUB, only the VPI/VCI address allocated to the communication terminal KE1 - KEn in the ATM-based communication network ATM-KN is known in the switching system PBX. Thus, it is not possible, for the reasons known in the introduction to the description, to locate the terminal KE1 - KEn in the ATM-based communication network ATM-KN, i.e. to associate it with an ATM hub ATM-HUB.

According to the present invention, an unambiguous address is allocated to each ATM hub ATM-HUB and, if necessary, each ATM network node in the ATM-based communication network ATM-KN for locating a communication terminal KE1 - KEn. This address is stored in a non-volatile memory of the ATM hub ATM-HUB and can be retrieved on request. If, for example, a fault is reported to the switching system PBX, or if it is necessary for any other reason to determine the association of a communication terminal KE1 - KEn with an ATM hub, the switching system PBX transmits a corresponding request message by means of the VPI/VCI address of the communication terminal KE1 - KEn stored in the switching system PBX.

For such a request message, the bits transmitted in the monitor status channels MR, MX are both set to the value 1 ( $MR = 1$ ,  $MX = 1$ ) or

alternatively to the value 0 ( $MR = 0$ ,  $MX = 0$ ). Furthermore, it is possible to establish a special protocol by means of which a message transmitted by the switching system PBX to a communication terminal KE1 - KEn is identified as a request message. This protocol can then be transmitted via the control information channel D or the monitor channel M from the switching system PBX to the ATM hub ATM-HUB associated with the corresponding communication terminal KE1 - KEn.

If an ATM hub ATM-HUB receives such a request message ( $MR = 1$ ,  $MX = 1$  or  $MR = 0$ ,  $MX = 0$ ), the ATM hub ATM-HUB transmits the address allocated to it in the ATM-based communication network ATM-KN via the monitor channel M according to the IOM-2 data format. The switching system PBX can associate the wanted communication terminal KE1 - KEn with an ATM hub ATM-HUB by means of the address transmitted via the monitor channel M.

The address of the ATM hub ATM-HUB is advantageously octet-oriented, i.e. the length of the address is a multiple  $m$  ( $m = 1, 2, 3, \dots$ ) of one byte. This provides for simple transmission of the address via the monitor channel M since the latter has a bandwidth of one byte per time-division multiplex frame IOMR.

Although modifications and changes may be suggested by those skilled in the art to which this invention pertains, it is the intention of the inventors to embody within the patent warranted hereon, all changes and

modifications that may reasonably and properly come under the scope of  
their contribution to the art. - -

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